



United Kingdom  
Butterfly Monitoring Scheme

# Annual Report 2015



# UKBMS Annual Report 2015

## The UKBMS

The UKBMS is run by Butterfly Conservation (BC), the Centre for Ecology and Hydrology (CEH), and the British Trust for Ornithology (BTO), in partnership with the Joint Nature Conservation Committee (JNCC), and supported and steered by Forestry Commission (FC), Natural England (NE), Natural Resources Wales (NRW), Northern Ireland Environment Agency (DOENI), and Scottish Natural Heritage (SNH).

The members of the UKBMS SG in 2015 were Tom Brereton (BC), David Roy (CEH), David Noble (BTO), Deborah Procter and Anna Robinson (JNCC), Keith Porter (NE), Dylan Lloyd (NRW), Simon Foster (SNH), Julia Garritt (FC) and John O'Boyle (DOENI).

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This report can be downloaded from  
<http://www.ukbms.org/reportsandpublications.aspx>

## UKBMS partners



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[www.naturalengland.org.uk](http://www.naturalengland.org.uk)



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[www.snh.gov.uk](http://www.snh.gov.uk)

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*Finally we would like to thank the Joint Reprographic Services (JRS) Unit - part of the support services to the UK Research Councils - for designing and printing the report.*

Cover photograph of Small Copper. This stunning butterfly had its worst year in the 40-year series. *Photograph by Iain H Leach*



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It was the 3rd best year in the series for Large Blue with annual abundance up by more than 100%. Photograph by Keith Warmington



2015 was a poor year for butterflies, with mean abundance at sites about half the long-term average. Photograph by Will Langdon.

## Online resources

Further information on the UK Butterfly Monitoring Scheme, including individual species and site trends, and how to take part in butterfly monitoring can be found at:

<http://www.ukbms.org/>

For the Wider Countryside Butterfly Survey go to

<http://www.ukbms.org/wcbs.aspx>

For online data entry go to

<http://www.ukbms.org/mydata/>

For information on Biodiversity Indicators go to

<http://www.jncc.defra.gov.uk/page-1824>

The following links provide more information on the UKBMS delivery partner organisations:

Butterfly Conservation:

<http://www.butterfly-conservation.org/>

Centre for Ecology & Hydrology:

<http://www.ceh.ac.uk/>

British Trust for Ornithology:

<http://www.bto.org/>



# News and research

## UKBMS HIGHLIGHTS IN NUMBERS

**2,436** 

The UKBMS continues to grow, with a record 2,436 locations monitored in 2015 by more than 2,000 recorders.

**1,100%** 

The number of sites monitored in the UKBMS has increased by 400 over the last three years and by 1,100% in the East Midlands since 2007.

**100** 

Brown Hairstreak egg counts have now been brought into the scheme, with a standardised method devised and a set of 100 randomly selected 1-km squares requiring annual survey.

**1,500** 

The online system continues to be developed with facility to enter timed counts and full integration with the Wider Countryside Butterfly Survey (WCBS). There are now over 1,500 registered users, with over 2,000 expected once WCBS integration is complete.

**40** 

The 40th anniversary of the scheme is being celebrated through a one day conference at CEH Wallingford on Saturday 12th November 2016. Guest speakers include Ernie Pollard, Chris Thomas, Jeremy Thomas and Keith Porter.

**11** 

The number of major research publications in 2015 using UKBMS data.

## REGIONAL TRANSECT GROWTH – LOCAL SUCCESSES

Transect monitoring grows from strength to strength, with numbers up by over 400 sites in the last three years. This amazing increase would not be possible without the enthusiasm and dedication of BC Branch transect co-ordinators. Many of these volunteers not only support existing transect recorders



With Ken Orpe at the helm, there has been an 1100% increase in the number of East Midlands transects since 2007

but also work to inspire new recruits, provide training and help set up new transect routes within their patch. None more so than Ken Orpe in the East Midlands. Back in 2007 there were only seven transects in the East Midlands, but Ken has transformed this (particularly since his retirement) to a position where they had 84 last year – an increase of 1,100%. This has taken the East Midlands up to second place in the annual league table of transect returns. They are now chasing Hampshire & the Isle of Wight, who have consistently supported more transects than any other Branch in the last few years. This is where Andy and Linda Barker are co-ordinating the only Branch with more than 120 active transects – 40 more than their nearest rival.

The largest increase in transects in 2015 came in Surrey & SW London, where the number rose from 59 to 82, leaving them just two behind the East Midlands Branch. Again, this increase can be put down to the dedication of the co-ordinator there, Bill Downey, who has done a fantastic job since taking over his position just a couple of years ago.

## UKBMS ONLINE DATA ENTRY SYSTEM UPDATE

Whilst the basic data entry system for transects has been working well for three years now, the system has continued to develop, especially to provide more features for the recorder. Last year basic data entry for timed counts was incorporated, enabling capture of a lot of additional monitoring that is being undertaken by volunteers for many of our priority species. There were 33 datasets received through the new timed count online system in 2015. These additional data are really helping us to provide more robust trends by covering additional sites. In autumn/winter 2016, a facility will be added to input Brown Hairstreak egg count data from the new survey method.

Most recently, the online system has now been extended to fully incorporate data entry for the Wider Countryside Butterfly Survey (WCBS). Existing squares have been set up, including digitised transect routes for many of these squares, and all historic data from previous years have also been uploaded to the system. If you walk a WCBS square as well as a transect please get in touch with Ian or Zoë, or for BTO BBS squares - Sarah, so that it can be linked to your existing account for data entry (see Team section on page 2 for contact details).

Loading of the Annual Summary page has been reworked to make the page perform more efficiently, but more importantly enhanced reporting, including the integration of site trends will be brought in during autumn 2016.

## THE STATE OF THE UK'S BUTTERFLIES 2015

Every five years, BC and CEH publish a 'state of the nation' assessment of the UK's butterflies, drawing on data from our extensive recording and monitoring schemes that are collected by tens of thousands of volunteer recorders. The reports set out the key results for butterfly species, highlights the



The State of the UK's Butterflies authors with Chris Packham at the launch in December 2015. Clockwise from top left: Martin Warren, David Roy, Nigel Bourn, Zoe Randle, Sam Ellis, Caroline Bulman, Tom August, Colin Harrower, Marc Botham, Tom Brereton, Ian Middlebrook, Chris Packham Richard Fox, and Katie Cruickshanks. Photograph by Jim Asher

implications of recent research and policy initiatives, and makes recommendations for the conservation of UK butterflies and wider biodiversity. The latest State of the UK's Butterflies report was published in December 2015, with UKBMS population trends for 56 (of 59) species and occurrence trends (based on the Butterflies for the New Millennium (BNM) distribution data) for 57 species.



A suite of wider countryside butterflies like the Small Skipper are declining in range and/or abundance, the reasons for which are not fully known. Photograph by Iain H Leach

The new analyses provide further evidence of the serious, long-term and ongoing decline of UK butterflies, with 70% of species declining in occurrence and 57% declining in abundance since 1976. Overall, 76% of the UK's resident and regular migrant butterfly species declined in either abundance or occurrence (or both) over the past four decades. By comparison, 47% of species increased in one or both measures. This is of great concern not just for butterflies but for other wildlife species and the overall state of the environment.

Multi-species measures show that both habitat specialist butterflies and wider countryside species decreased significantly in abundance and occurrence. Indeed, a number

of wider countryside species (e.g. Wall and Small Heath) now rank among the most severely declining UK butterflies. The destruction and deterioration of habitats as a result of land-use change (e.g. intensification of agriculture, changes in woodland management) are still considered the primary causes of long-term decline among habitat specialist butterflies in the UK. However, the factors responsible for the recent declines of wider countryside species are not well understood.

The minority of UK butterflies that have fared well since the 1970s have increased their distributions, most likely as a response to climate warming. However, species' responses to climate change are much more variable than previously realised and the increasing frequency of extreme climatic events, predicted in many climate change scenarios, may have serious implications for butterfly populations. On a positive note, trends over the past decade show that the long-term declines of some threatened species have been halted, with small recoveries seen in some areas. Examples include the Duke of Burgundy, Pearl-bordered Fritillary and Dingy Skipper. Landscape-scale conservation projects targeting threatened species have proved successful and should be rolled out to cover more species in more landscapes. However, even for those species where declines have recently been halted, population levels and distributions are much smaller than they once were. The conservation of the UK's butterflies remains an enormous challenge.

## BROWN HAIRSTREAK SURVEY LAUNCHED

A UK-wide survey to improve monitoring coverage of Brown Hairstreak was launched in the winter of 2015/16. This species is not well monitored by butterfly transects, but the eggs are relatively easy to find in the winter, so a standardised method to monitor Brown Hairstreak eggs has been developed.

Across the UK, 100 squares have been randomly selected to be sampled. This includes 75 squares with known presence and a further 25 within the species range and suspected to be highly suitable based on a statistical modelling analysis (completed by CEH). Guidance notes, a recording form and other supporting documentation are available at <http://www.ukbms.org/resources.aspx> whilst random squares are available from Transect Co-ordinators.



Winter Brown Hairstreak egg counts on Blackthorn now form part of the UKBMS. Photographs by Jim Asher and Tom Brereton





## TRENDS ON BUTTERFLY CONSERVATION RESERVES

Butterfly Conservation owns or manages 35 nature reserves covering about 785 hectares across England, Scotland and Wales. A couple of years ago we had a Spanish student, Carles Burguera, based at Manor Yard for the summer and he pulled together a lot of monitoring data from these reserves. Following on from his work, we have carried out detailed analysis using data from 48 transect routes along with several timed counts and larval web counts. This has helped us get an overall picture of how butterfly populations are affected on sites where we are directly responsible for the habitat management.

When we look at the generalist wider-countryside species, they are showing a significant decline on our reserves since 1995, with eight species in decline and just two increasing. However, this performance simply mirrors what is happening across the UK as a whole over that period. In fact the trends for many species on our reserves follow the national trends very closely. This is no great surprise, as these generalist species are rarely the target for special management.



Southrey Wood Butterfly Conservation Reserve. Photograph by John Davis

The big difference comes when we look at a composite trend for habitat specialists. The good news is that there is an overall upward trend on our reserves since 2000, against a UK-wide decline for specialists over the same period. Out of the 19 habitat specialists monitored regularly on our reserves, seven species have experienced significant increases or performed significantly better than the UK trend. In comparison, just four species had experienced significant declines on our reserves and only two of these have performed worse than the national trend (Figure 1).

We find that where species have performed badly, they are on relatively small isolated sites where re-colonisation is more difficult after local extinctions in a poor year. This is particularly true of Wood White, which was lost from two of our reserves around 2008-09. The more positive stories tend to come from

reserves which form part of a well-connected landscape and where targeted management has reaped dividends. Great examples include Pearl-bordered Fritillary at Eyarth Rocks, Heath Fritillary at Lyford and Duke of Burgundy at Prestbury Hill, as well as a number of other grassland species at sites like Magdalen Hill Down.

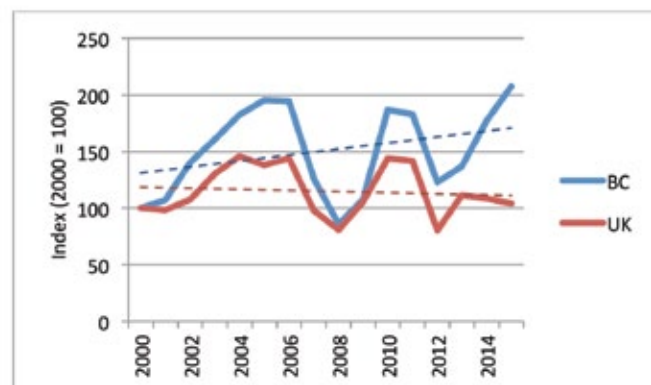


Figure 1: Trends in butterfly populations for habitat specialists on BC reserves (blue) versus the UK (red) 2000 to 2015

## UKBMS 40-YEAR CELEBRATIONS - PROGRAMME ANNOUNCED

We would like to give advance notice of an upcoming meeting to celebrate the 40th anniversary of the UKBMS; on Saturday 12th November 2016, from 11.00 – 18.30 (provisional timing) at CEH Wallingford (Oxfordshire, OX10 8BB). The event aims to highlight the UKBMS's contribution to monitoring and conservation and to celebrate the many people who have contributed to its great success. There will be a series of talks, extended lunch/tea breaks to allow time to catch up with other butterfly transect enthusiasts, plus a drinks reception to finish. Speakers include those actively involved in the running of the scheme as well as Ernie Pollard, Martin Warren and Jeremy Thomas who were instrumental in its development. Places are likely to be limited, so please book attendance early by emailing [ukbms40@ceh.ac.uk](mailto:ukbms40@ceh.ac.uk).



Ernie Pollard, who devised the UKBMS transect method, will headline at the scheme's 40-year symposium



Northern Brown Argus. Photograph by Jim Asher

## EUROPE – EBMS/GRASSLAND INDICATOR UPDATE

Butterfly monitoring enjoys a growing popularity in Europe with new schemes continuing to be established; standardised butterfly monitoring schemes now operate in 22 countries across the continent. A new initiative, the European Butterfly Monitoring Scheme (eBMS) has been set up, under the auspices of Butterfly Conservation Europe, to foster collaboration between these schemes. The eBMS is managed by the Natural Environment Research Council (acting through CEH).

An initial focus of eBMS is to produce a centralised database of butterfly monitoring scheme data in order to enable its use to answer pressing questions about the status of butterflies at large spatial scales. National schemes partners in the eBMS to date are the UK (through the UKBMS), Finland, Germany, Spain (Catalonia) and the Netherlands. Further schemes will be invited to join over the coming year. The eBMS also provides a focus for large-scale projects linked to butterfly monitoring schemes. These projects will be advertised via the eBMS website ([www.butterfly-monitoring.net](http://www.butterfly-monitoring.net)).

## ANALYTICAL DEVELOPMENTS

In the past five years, there has been rapid, world-leading development of a suite of statistical models for analysing butterfly monitoring data. This work has primarily been undertaken as part of MSc and PhD research projects by Emily Dennis (supported by supervisors at the University of Kent, Butterfly Conservation and CEH) and subsequently through investment since 2015 by Butterfly Conservation, as well as related research projects and investment at CEH over several years.

There are now a suite of new methods available or in development to analyse UKBMS butterfly monitoring data, including those that are potentially more efficient or give extra information such as productivity and other demographic data. At the same time, online developments have progressed rapidly.

Further work is required to more fully realise three key benefits of recent statistical and data management developments:

1. To enhance the efficiency of data processing, to provide cost savings in the staff time required for running the scheme, to expand the reporting for contributors and to enable more rapid reporting.

2. To enhance the scope of the UKBMS to better report on the status of butterflies at national, regional and site scales and to measure progress of key biodiversity policies
3. To ensure a consistency in approach across all organisations (including BC and CEH) when reporting on butterfly population trends at all scales

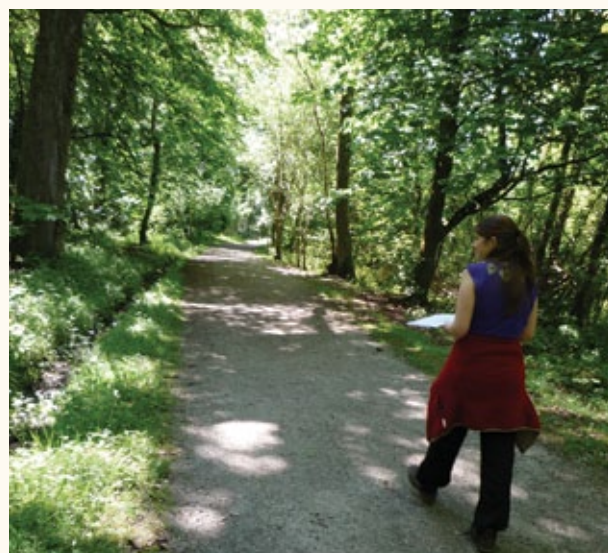
We are currently discussing with partners the investment required and possible funding options to deliver this exciting programme of work, to further modernise the UKBMS.

## NEW STATE OF NATURE REPORT

The first State of Nature report launched in 2013 revealed the severe loss of nature that has occurred in the UK since the 1960s. There have recently been some exciting developments, captured in a new report to be published in September 2016. These include:

- A doubling of the number of nature conservation organisations involved
- Analyses updated with three more years of data
- A 20% increase in the number of long-term species trends assessed, with improved analytical techniques
- A near doubling of the number of species assessed using Red List criteria
- A detailed analysis of the causes of biodiversity change
- An improved assessment of change in the marine environment

Once again UKBMS and other butterfly and moth monitoring data have been used extensively in the report, which showcases the amazing contribution volunteers make to understanding biodiversity change.



Volunteer collected data underpins the new State of Nature report. Photograph by Katie Cruickshanks





## RESEARCH

### Ongoing projects

The UKBMS data continues to be used for a wide range of research projects, with, for example 11 peer-reviewed publications arising in 2015. The following is a brief description of some of the larger projects using UKBMS data in 2015.

#### **A study to develop the scope for monitoring landscape-scale biodiversity impacts of agri-environment schemes (AES) in England.**

Led by Dr Jo Staley at CEH, this project will firstly review evidence and consult experts about the potential for various taxa a) to respond to AES management at the landscape scale and b) to be good candidates for a monitoring scheme. Following this, the project aims to develop an outline methodology for how the monitoring could be achieved.

Data from the UKBMS will be used to parametrise data simulations for power analysis. The study will also draw heavily on previous studies and reports that have used UKBMS data in the context of AES uptake.

Provisional results have shown that butterflies are the only invertebrate group for which landscape-scale responses to AES in England have previously been demonstrated (at least to some extent). A proposed monitoring scheme if funded is likely to be compatible with WCBS methods, and to draw on WCBS data, potentially in an attempt to predict butterfly responses to AES across broader geographical areas than the one or two locations where new monitoring is suggested.

#### **Development and testing of monitoring to support the National Pollinator Strategy**

The objectives of this project led by Dr Claire Carvell at CEH were:

1. To identify a robust sampling framework for national pollinator monitoring

### Research publications in 2015

Botham, M.S., Fernandez-Ploquin, E.C., Brereton, T., Harrower, C.A., Roy, D.B. & Heard, M.S. (2015). Lepidoptera communities across an agricultural gradient: how important are habitat area and habitat diversity in supporting high diversity? *Journal of Insect Conservation* 19: 403-420 doi:10.1007/s10841-015-9760-y

Curtis, R.J., Botham, M.S., Brereton, T.M. & Isaac, N.J.B. (2015). The Rise and Demise of the Glanville Fritillary on the Isle of Wight. *Journal of Insect Conservation* 19: 305-311. doi: 10.1007/s10841-014-9737-2

Curtis, R.J., Brereton, T.M., Dennis, R.L.H., Carbone, C. & Isaac, N.J.B. (2015). Butterfly abundance is determined by food availability and is mediated by species traits. *Journal of Applied Ecology* 52: 1676-1684 doi:10.1111/1365-2664.12523

Eglington, S.M., Brereton, T.M., Tayleur, C.M., Noble, D., Risely, K., Roy, D.B. & Pearce-Higgins, J.W. (2015). Patterns and causes of covariation in bird and butterfly community structure. *Journal Landscape Ecology* 30: 1461-1472

Eaton, M.A., Burns, F., Isaac, N.J.B., Gregory, R.D., August, T.A., Barlow, K.E., Brereton, T., Brooks, D.R., Al Fulaij, N., Haysom, K.A., Noble, D.G., Outhwaite, C., Powney, G.D., Procter, D. & Williams, J. (2015). The priority species indicator: measuring the trends in threatened species in the UK. *Biodiversity* 16: 108-119

Fox, R., Brereton, T.M., Asher, J., August, T.A., Botham, M.S., Bourn, N.A.D., Cruickshanks, K.L., Bulman, C.R., Ellis, S., Harrower, C.A., Middlebrook, I., Noble, D.G., Powney, G.D., Randle, Z., Warren, M.S. & Roy, D.B. (2015). The State of the UK's Butterflies 2015. Butterfly Conservation and the Centre for Ecology & Hydrology, Wareham, Dorset

Gilburn, A.S., Bunnefeld, N., McVean Wilson, J., Botham, M.S., Brereton, T.M., Fox, R. & Goulson, D. (2015) Are neonicotinoid insecticides driving declines of widespread butterflies? *PeerJ* 3: e1402 <https://doi.org/10.7717/peerj.1402>

2. To develop and test new methods for monitoring pollinators and pollination services to crops as part of this framework (with a focus on bees and hoverflies)

A major output is the development of a National Pollinator and Pollination Monitoring Framework (NPPMF) to guide future monitoring and build on existing citizen science activity. UKBMS data was used to parametrise data simulations for power analyses and the transect methodology itself to develop some of the standardised survey options for monitoring pollinators. The final report for this project can be downloaded here: <http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=2&ProjectID=19259>

#### **The role of habitat heterogeneity in climate-proofing conservation: integrating effects of microclimate on population dynamics and local adaptation**

James Stewart, a PhD student at the University of Exeter, will sample habitat type and quality across transects on which Brown Argus is found and relate this to UKBMS population trends for this species. His work will further investigate egg-laying behaviour and host choice in this species.



New research will help further understand the causes of Brown Argus population change Photograph by Neil Hulme

#### **Comparison of butterfly trends on National Nature Reserves (NNRs)**

A Natural England project led by Ben Le Bas will compare butterfly population trends on NNRs with national values. Comparisons and analysis of trends on NNRs will help the development of an NNR strategy for England.

Oliver, T.H., Marshall, H.H., Morecroft, M.D., Brereton, T., Prudhomme, C. & Huntingford, C. (2015). Interacting effects of climate change and habitat fragmentation on drought-sensitive butterflies. *Nature Climate Change* 5: 941-945 doi:10.1038/nclimate2746

Roy, D.B., Ploquin, E.F., Randle, Z., Risely, K., Botham, M.S., Middlebrook, I., Noble, D., Cruickshanks, K., Freeman, S.N. & Brereton, T.M. (2015). Comparison of trends in butterfly populations between monitoring schemes. *Journal of Insect Conservation* 19: 313-324. doi:10.1007/s10841-014-9739-0

Roy, D.B., Oliver, T.H., Botham, M.S., Beckmann, B., Brereton, T., Dennis, R.L.H., Harrower, C., Phillimore, A.B. & Thomas, J.A. (2015). Similarities in butterfly emergence dates among populations suggest local adaptation to climate. *Global Change Biology* 21: 3313-3322 doi:10.1111/gcb.12920

Van Swaay, C., Van Strien, A., Aghababayan, K., Astrom, S., Botham, M., Brereton, T., Chambers, P., Collins, S., Domenech Ferre, M., Escobes, R., Feldmann, Fernandez-Garcia, J.M., Fontaine, B., Goloshchapova, S., Gracianteparaluceta, A., Harpke, A., Heliola, J., Khanamirian, G., Julliard, R., Kuhn, E., Lang, A., Leopold, P., Loos, J., Maes, D., Mestdagh, X., Monasterio, Y., Munguira, M.L., Murray, T., Musche, M., Ounap, E., Pettersson, L., Popoff, S., Prokofev, I., Roth, T., Roy, D., Settele, J., Stefanescu, C., Svitra, G., Teixeira, S.M., Tiitsaar, A., Verovnik, R. & Warren, M. (2015). The European Butterfly Indicator for grassland species: 1990-2013. Wageningen, The Netherlands, De Vlinderstichting, 37pp. (Report VS2015.009)



# Background and methods

*Trends in butterfly populations were compiled from a network of 2,436 sample locations in 2015 and 4,591 locations across all years.*

## Species indices and trends

In the UKBMS, data on the population status of UK butterflies is derived from a wide-scale program of site-based monitoring and sampling in randomly selected 1km squares.

The majority of sites are monitored by butterfly transects. The 'traditional' transect method, which was developed from 1973-75 and launched in 1976, involves weekly butterfly counts along fixed routes through the season made under strict weather, recording area and time of day criteria (Pollard & Yates 1993). Weekly counts for each species are summed to generate site annual abundance indices. For sites with missing weekly counts, a statistical model (a Generalised Additive Model, 'GAM') is used to impute the missing values and to calculate a site index (Rothery & Roy 2001).

For a number of habitat-specialist species (especially the fritillaries) 'reduced effort' methods are also used to monitor annual abundance at the site level, especially in more remote parts of the UK, for example; adult timed counts for fritillaries (Warren et al. 1981), larval web counts for Marsh Fritillary (Lewis & Hurford 1997) and egg counts for Large Blue (Thomas et al. 2009). For timed count and larval search methods, systematic recording is made on single days in suitable weather (when UKBMS recording criteria are met), with the counts converted to a site index that accounts for both the size of the colony and the time in the season when the count was made.

The Wider Countryside Butterfly Survey (WCBS) was established in 2009 to improve data on the national population status of butterflies across the countryside as a whole. This is important given that most site-based monitoring is biased towards good quality semi-natural habitat relatively rich in butterflies. In the WCBS, BC recorders are allocated randomly selected 1km squares within the county in which they live, whilst BTO recorders are given the opportunity to survey their existing Breeding Bird Survey squares. Both sets of surveyors are asked to survey these squares at least twice over the July and August period with visits spaced ten days apart. Optional visits are encouraged, especially in the spring to sample Orange-tip and for the first generation of bivoltine species. On each visit, recorders survey two parallel 1km survey lines evenly spaced ca300m apart. Along the survey lines, recorders count butterflies, day-flying moths and dragonflies using the same time of day, recording width and weather condition criteria used in transect monitoring. Due to the low level of sampling effort (and unlike conventional transects), WCBS data is not used to derive local measures of butterfly abundance.

In 2013 we implemented a new analysis method for the 25 wider countryside species, to make better use of available transect data, and to incorporate WCBS data in order to compile more representative national and UK indices. Briefly, the new method (Dennis et al. 2012) uses a two-stage model. Firstly, all butterfly counts in a season from both traditional UKBMS transects and wider countryside squares are used to estimate the seasonal pattern of butterfly counts for that year. This stage relies heavily on the traditional UKBMS data with good coverage throughout the season. A second stage of the model is then applied to the full set of annual counts, accounting for where the counts occur within the flight season, to then calculate annual population indices and trends.

Work to apply this method to habitat specialist species has not yet been completed, because not all required raw data (weekly counts) are available from earlier in the time series. Hence, for habitat specialists, the old method continues to be used. Regular migrants are also analysed using the old method due to high annual variability in abundance. In this method, site index data from all past and present transects and timed counts/larval webs at monitored sites is combined each year to derive national and UK 'Collated' Indices (CI) and to estimate trends over time. Because not all sites are monitored each year, a statistical model (using log-linear regression) is needed to estimate missing values and to produce national indices and trends. The model takes into account the fact that for a particular butterfly species, some years are better than others (a year effect), typically due to the weather, and some sites support larger populations than others (a site effect). Bootstrapping is the preferred method for estimating the precision of indices and trends, when required.



Heath Fritillary numbers are chiefly monitored by timed counts on Exmoor.  
Photograph by Will Langdon



## Composite measures of butterfly abundance

Multi-species (composite) indices of butterfly abundance are calculated using a generalised linear model accounting for species and year. Grouped measures have been compiled for all resident species, wider countryside species, habitat specialists and the three regular migrants. In addition, England is further categorised by broad habitat groupings (farmland and woodland) (Brereton *et al.* 2011).

To identify underlying patterns in population trends in these grouped measures, assessment of change is based on trends in the underlying smoothed indices. Calculation of smoothed indices and trends and confidence intervals in them are assessed by structural time-series analysis and the Kalman Filter as implemented in the program TrendSpotter (Soldaat *et al.* 2007). A statistical test is performed using the software TrendSpotter to compare the difference in the smoothed index in the latest year versus other years in the series. Within the measures, each individual species trend is given equal weight, and the annual figure is the geometric mean of the component species indices for that year. Populations of individual species within each measure may be increasing or decreasing, irrespective of the overall trends.

The composite measures provided in this report, though not Official Statistics are derived in the same way as biodiversity indicators previously published by UK, English and Scottish Governments. However, they may differ (usually in a small way) in terms of species composition and the sites used in the

analysis. For reasons of consistency, published indicators have used a fixed set of species (from the start year), with the same species/year combinations in annual updates<sup>1</sup>. Composites in this report, where possible include additional species, reflecting improvements in monitoring coverage since the development of indicators, whilst analytical methods to produce indicators are likely to be revised in 2016.

**Brereton T.M., Roy D.B., Middlebrook, I., Botham, M. and Warren, M.** (2011). The development of butterfly indicators in the United Kingdom and assessments in 2010. *Journal of Insect Conservation* 15: 139-151.

**Lewis, O.T., & Hurford, C.** (1997). Assessing the status of the Marsh Fritillary (*Eurodryas aurinia* Rott.) – an example from Glamorgan (UK). *Journal of Insect Conservation* 1:159-161.

**Pollard, E., & Yates, T.J.** (1993). Monitoring Butterflies for Ecology and Conservation. Chapman and Hall, London 2.

**Rothery, P., & Roy, D.B.** (2001). Application of generalized additive models to butterfly transect count data. *Journal of Applied Statistics* 28:897-909.

**Soldaat, L.L., Visser, P., van Roomen, M., & van Strien, A.** (2007). Smoothing and trend detection in waterbird monitoring data using structural time-series analysis and the Kalman filter. *Journal of Ornithology* Vol. 148 suppl. 2: Dec. 2007.

**Warren, M., Thomas, C.D., & Thomas, J.A.** (1981). The Heath Fritillary. Survey and conservation report. Unpublished report to the Joint Committee for the Conservation of British Insects. Butterfly Conservation, Wareham.

<sup>1</sup> Due to user requirements and to avoid the possibility of annual changes in indicators being attributable to changes in the component species

## Sample coverage

### UKBMS sites

Since 1976, an overall total of 2,776 sites have contributed data to the scheme. In 2015, 1,424 transects, and 210 non-transect sites were monitored, with the total of 1,634 sites representing a rise of 13% over the previous best ever total in 2014. Of these, 91% of sites (1,301) produced indices for at least one species.

At the Country-level there were 1,340 monitored sites in England, 89 sites in Wales, 145 sites in Scotland, 29 sites in Northern Ireland, and 31 from the Channel Islands.

There is approximately a 13% turnover of sites each year. In 2015, a further 223 new sites were established and monitored



A record 325 calcareous grassland sites were monitored in 2015. Photograph by Tom Brereton

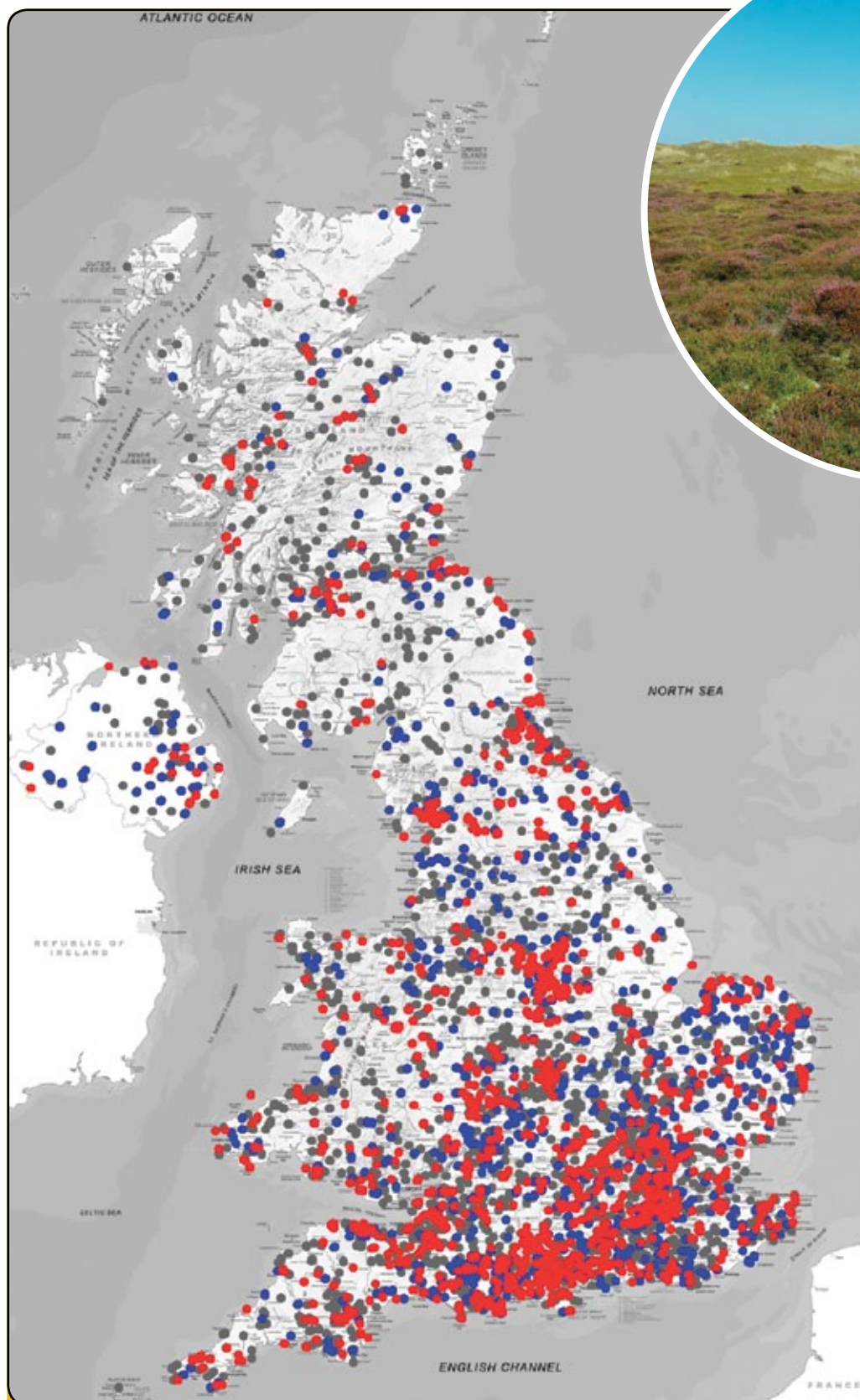
for the first time. 13 of these were in Scotland, 11 in Wales and 8 on the Channel Islands, whilst the rest were in England. Additionally, 106 sites were re-established. Improvements in coverage from England, Wales and the Channel Islands masked slight drops in coverage in Scotland and Northern Ireland.

### Wider Countryside Butterfly Survey (WCBS)

The WCBS ran for a seventh year in 2015, supplying count data for compilation of collated indices for common and widespread species. In total, around 3,000km of survey line was walked by 690 recorders who made 1,651 visits to 802 squares (62% by BC, 38% BTO BBS). 77% of squares received the required two visits over the core July and August period. From April-June, 188 visits were made to 151 squares targeted at single-brooded early flyers.

Overall, there was a net loss of 36 squares (-4%) from 2014, although 93 new squares were established (BC 46 and BTO BBS 47). The greatest drop in participation was in BTO BBS squares, with 17% fewer sampled than in 2014. However, in some areas BTO BBS coverage was boosted, for example, Yorkshire gained five squares compared with 2014. Plans are in place to redress this drop in coverage for 2016.





Winterton Dunes,  
Norfolk. Photograph by  
Tom Brereton

**Figure 2: Location of monitored sites in 2015.** UKBMS sites producing a site index (red circles), WCBS squares walked (blue circles), sites and squares not walked in 2014 (grey circles)





# The 2015 season

## SUMMARY

- Butterflies had rallied in 2013 and 2014 following the worst year on record in 2012, but got knocked back badly in 2015.
- Some 35 of the 58 butterfly species monitored through the UKBMS (60% of the total) experienced declines from 2014 levels, three species (**Dingy Skipper**, **Grizzled Skipper** and **Marbled White**) showed no change, whilst the remaining 20 (35%) increased.
- It was not surprising that 2015 was a poor year for butterflies, the 9th worst in the 40-year series, given poor weather over much of the season. A colder than average spring gave way to the coldest summer for three years, which was wetter and duller than average.
- Two species registered their worst years on record: the **Heath Fritillary** was down by 16% compared to 2014 whilst **Small Copper** was down by almost a quarter and now shows a significant decline over the 40-year monitoring period.
- For the second year running **White-letter Hairstreak** had an extremely poor year succeeding 2014 as the second worst year on record with a further annual decline of 18%.
- The largest annual decline in a resident species was claimed by **Swallowtail**, with a 65% decrease.
- It was a poor year for the 'golden skippers'. **Small**, **Essex** and **Lulworth Skipper** had well below average years, whilst **Large Skipper** declined in abundance by 19% from 2014 levels.
- It wasn't all doom and gloom; two species, **Marbled White** and **Brimstone**, had their best year in the series. A sunnier and drier than average June may have benefitted these and several other early summer flying species that fared well.
- The most positive news for our rarer species was of welcome increases in **Large Blue** (up by 129%) and **Black Hairstreak** (up by 141%, at the small number of monitored sites).
- Of the blues, **Holly Blue** was perhaps the biggest winner with a 227% increase over 2014 levels.
- It was a disappointing year for both **Peacock** and **Small Tortoiseshell** (down by 21% and 44% respectively) after promising numbers were recorded on transects in the early spring.
- **Wall**, **Small Tortoiseshell**, **Green-veined White**, **Grayling**, **Speckled Wood**, **Brown Argus** and **Purple Emperor** numbers were down by a quarter or more over 2014 levels, with all of these species having below average years.
- It was a decidedly average year for the three regular migrants, **Red Admiral**, **Painted Lady** and **Clouded Yellow**.
- It was a late season overall, with almost two-thirds of species appearing later than the 10-year average (2005-2014) and 90% having a later mean flight date than in 2014.
- The mean flight date across all species was four days later than the series average, compared with seven days earlier in 2014.
- Rather surprisingly, the butterfly season peaked (slightly early) in mid to late July, with a rapid tail off by mid-August.
- Though better than in 2014, the mean abundance of butterflies at sites in August was about half that of the long-term average.



Holly Blue. Photograph by Tim Melling

## SEASONAL AND MONTHLY ROUND-UP

The first half of **JANUARY** was very mild, with temperatures peaking at 17°C in *Devon* on the 9th. Thereafter much colder weather predominated, leading to the month being close to the long-term average in terms of temperature. Rainfall and sunshine were above average, by 127% and 124% respectively, the latter making it the equal-fifth sunniest since 1929. Given the warm and sunny start to the month, it was not surprising that a number of butterflies made an appearance, with six species logged. On the 1st **Red Admiral** was seen in *Devon*, *Dorset* and *Surrey*<sup>2</sup>, with **Peacock** seen in *Dorset*, *Norfolk*, *Sussex* and *Warwickshire*. These were followed by **Small Tortoiseshell** in *Kent* and **Comma** in *Berkshire* on the 2nd, **Brimstone** on the 5th in *Yorkshire*, and **Painted Lady** on the 13th in *Surrey*. With temperatures in the day as low as -14°C in the latter half of the month, not unexpectedly, no new butterfly species were seen.



Marbled White. Photograph by Nigel Kiteley

<sup>2</sup> Where only the county names are given, data is from the BNM per Richard Fox, Butterfly Conservation



At the start of **FEBRUARY**, the weather was predominantly cold and rather dry, whilst later in the month a westerly airflow brought milder, unsettled conditions, with spells of heavy rain and strong winds featuring. Overall, February was slightly colder, drier and sunnier than average. Temperatures fell to  $-11^{\circ}\text{C}$  in *Cumbria* on the 3rd and peaked at nearly  $16^{\circ}\text{C}$  in *Aberdeenshire* on the 18th. Just one new species was observed during the month, this being a **Small White** on the 15th in *Cornwall*, which was ten days earlier than the first sighting (from *Sussex*) in 2014.

### Spring

Apart from a settled spell mid-month, much of **MARCH** was unsettled. Despite this, overall rainfall and temperature levels were close to the long-term average and it was a sunny month, with the UK receiving 120% of average sunshine hours. The maximum temperature was  $17.4^{\circ}\text{C}$  in *Suffolk* on the 7th. There were first sightings for eight species (one less than in 2014), most of which were seen later than in 2014. Sightings started with **Speckled Wood** on the 6th in *Dorset* - a species seen as early as January in both 2013 and 2014. A gap of almost two weeks passed without further interest, until the 19th, when there were sightings of **Orange-tip** in *Dorset*, **Small Copper** in *Glamorgan* (three weeks later than in 2014) and **Holly Blue** in *Cornwall* (eleven days later than in 2014). Towards the month-end, **Clouded Yellow** was seen on the 24th in *Devon*, **Large White** on the 25th in *Yorkshire*, **Wall** on the 26th in *Cornwall* (same date as in 2014) and **Green-veined White** on the 30th in *Greater London*.

**APRIL** began and ended unsettled, but in-between there were some fine spells of warm, dry and sunny weather. The UK mean temperature was slightly above the 1981-2010 average (by  $0.5^{\circ}\text{C}$ ), whilst rainfall was well below average (63%). Sunshine was well above normal in most areas, and the UK received 144% of average sunshine hours, making it the sunniest April in a series starting in 1929. Temperature reached a maximum of over  $25^{\circ}\text{C}$  in *Kent* on the 15th. Twelve species had their first sightings over the course of the month. These were **Green Hairstreak** (4th in *Cumbria*), **Dingy Skipper** (7th



Orange-tips were a week later than average in 2015, with annual abundance down by a fifth. Photograph by Will Langdon

*Levin Down*<sup>3</sup>, *West Sussex*), **Grizzled Skipper** (9th *Magdalen Hill Down, Hampshire*), **Duke of Burgundy** (12th *Yew Hill, Hampshire*), **Common Blue** and **Pearl-bordered Fritillary** (14th in *Sussex* and *Cornwall* respectively), **Small Heath** and **Wood White** (15th *North Wyke and Meeth Quarry* in *Devon* respectively), **Brown Argus** (19th in *Glamorgan*), **Cryptic Wood White** (21st *Craigavon Lakes, Armagh*), **Small Blue** (28th in *Dorset*) and **Small Pearl-bordered Fritillary** (30th in *Devon*). Of the species 'emerging' this month, eight of the twelve were seen on later dates than in 2014, the most extreme examples being **Small Heath** and **Small Blue**, by 14 and 15 days respectively.

Unsettled weather continued into **MAY** and was present over much of the month. It was a cold and wet month, with mean temperature almost a degree lower and rainfall 158% of the 1981-2010 average. Sunshine levels were also lower than average. Daytime temperature reached no more than  $24^{\circ}\text{C}$  (*Kent* on the 11th), making it the lowest May maximum since 1996. Over the month, 15 species emerged (two more than in 2014), starting on the 3rd with **Marsh Fritillary** in *Wiltshire*. These were followed by **Adonis Blue** (4th *Swanage, Dorset*), **Glanville Fritillary** (4th *Isle of Wight*), **Large Skipper** (7th *Winnall Moors, Hampshire*), **Gatekeeper** (12th *Grouville Golf Course, Jersey*), **Swallowtail** (13th *Norfolk*), **Chequered Skipper** (14th *Glasdrum, Strathclyde*), **Heath Fritillary** (16th *Luckett Wood, Cornwall* and *Blean Woods, Kent*), **Meadow Brown** (again on the 16th *Luckett Wood, Cornwall*), **Lulworth Skipper** (21st *Dorset*), **Silver-studded Blue** (21st *Mynydd Marian, Denbighshire*), **Small Skipper** (25th *Wigmore Rolls, West Midlands*), **Northern Brown Argus** (28th *Borders*), **Ringlet** (28th *West Malvern, Hereford & Worcester*) and **Grayling** (30th *Sorel, Jersey*). Of note, six of the 16 were first recorded on exactly the same day as in 2014, including **Small Pearl-bordered Fritillary**, **Marsh Fritillary**, **Adonis Blue**, **Chequered Skipper**, **Lulworth Skipper** and **Small Skipper**, whilst **Large Skipper** was first seen 39 days later than in 2014. The mean flight date of single-brooded spring-flying species was typically 4-7 days later than the series average.



Small Tortoiseshells were out in *Kent* and *Berkshire* on 2nd January. Photograph by Jim Asher

<sup>3</sup> Place names refer to transects or other UKBMS monitored sites

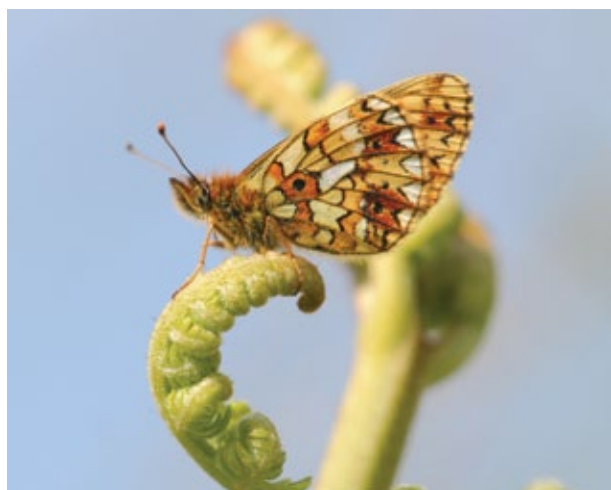


Abundance for the six single-brooded spring-flying species changed little from 2014 levels, other than for **Glanville Fritillary** which increased by two-thirds at remaining monitored sites (far fewer sites than in 2014). **Grizzled Skipper**, **Pearl-bordered Fritillary** and **Green Hairstreak** had below average years and remain in significant long-term declines, whilst **Dingy Skipper**, **Orange-tip** and **Glanville Fritillary** had above average years and show no significant change over the long term.

## Summer

Following an initial spell of unseasonably wet and windy weather **JUNE** was characterised by being generally fine and dry, though it was on the cool side. Compared with the 1981-2010 average, UK mean temperature was 0.3°C below, whilst the rainfall total was 77% of the average and sunshine 112%; the latter making it six out of seven successive months that were sunnier than average. There were regional variations and Scotland fared worse, with the weather being colder, wetter and duller than other UK countries. Temperature peaked at 32.5°C in *Greater London* at the month-end. First sightings were made for 14 species including **Purple Hairstreak** (3rd *Castor Hanglands, Cambridgeshire*), **Dark Green Fritillary** (4th *Aish Tor, Devon*), **Large Blue** (4th in *Somerset*), **Mountain Ringlet** (4th in *Cumbria*), **Silver-washed Fritillary** (4th *Chaddesley Wood, Hereford & Worcester* and *Kilhampton Common, Cornwall*), **Marbled White** (7th *Walton Common, Avon*), **High Brown Fritillary** (8th *West Down, Dartmoor*), **Large Heath** (8th in *Lancashire*), **Black Hairstreak** (11th *Monks Wood, Cambridgeshire*), **White Admiral** (11th *Bowdown (Baynes/Bomb)* in *Berkshire*, **White-letter Hairstreak** (12th in *London*), **Essex Skipper** (16th *Bennett's Patch and White's Paddock, Bristol*), **Chalkhill Blue** (24th in *Dorset*) and **Purple Emperor** (27th in *Hampshire*). Dates of first sightings were similar to 2014, exceptions being **Purple Emperor** and **Essex Skipper**, which were later by 10 and 16 days respectively.

Not many butterfly species did well in 2015, but those that did were chiefly single-brooded early summer species including **Marbled White** (best year in series), **Large Blue** (3rd best



Small Pearl-bordered Fritillary. Photograph by Will Langdon



Black Hairstreak. Photograph by Iain H Leach

year), **Ringlet** (3rd best), **Black Hairstreak** (4th best), **Silver-washed Fritillary** (4th best) and **Dark Green Fritillary** (7th best). **Black Hairstreak** increased by 141% and **Large Blue** by 129% over 2014 levels, these were the 3rd and 4th largest annual increases for UK butterflies respectively. Noteworthy annual increases for **Marbled White** included from 145 to 403 at *Lydlinch Common* and from 96 to 386 at *Powerstock Poorwood*, both in *Dorset*; and from 548 to 1,571 at *West Sedgemoor South, Somerset*. Other June-flying species which did well included **Brimstone**. The butterfly had its best year in the 40-year series, with noteworthy annual increases including from 108 to 284 at *Farthing Down (New Hill)*, *Surrey* and from 62 to 155 at *Shapwick Heath East, Somerset*.

For all the species described above which did particularly well, June is a crucial month, either for development of the later immature stages, adult emergence and/or peak abundance. It seems likely that they benefitted from sunnier and drier than average June weather boosting survival rates. Additionally **Brimstone**, which also flies in spring, may have benefitted from sunny weather over that period as this is when the larvae from the overwintering adults are developing. Numbers in the previous year are likely to have played a role in species' favourable fortunes (known as 'density dependence') as **Ringlet**, **Brimstone**, **Marbled White** and **Silver-washed Fritillary** all had extremely good years in 2014.

Some June-flying species which fared less well included wetland and/or upland species such as the **Swallowtail** (65% decrease on 2014 levels, 11th worst year in series), **Small Pearl-bordered Fritillary** (17% decrease, 4th worst year), **High Brown Fritillary** (43% decrease, 15th worst) and **Heath Fritillary** (16% decrease, 6th worst). *Sutton Fen* in *Norfolk* is one of the premier sites for **Swallowtail**, so it was worrying to see that abundance dropped from 114 in 2014 to 26 in 2015. For **High Brown Fritillary**, the largest annual decreases were seen on *Dartmoor* including at *Aish Tor* and *Trentishoe Combe*. **Heath Fritillary** numbers held up in *Kent*, but on *Exmoor* populations crashed at several sites including *Hanny Combe*, *Hollow Combe*, *Rey Combe* and *Spangate*.





Wall. Photograph by Jim Asher

**Large Blue** was one of the few species to have an earlier mean flight date in 2015 than the long-term average, with the advance by five days being greater than for any other species. **Glanville Fritillary** and **Mountain Ringlet** also had earlier than average mean flight dates.

Hot weather at the end of June continued into **JULY**, forming a mini heat wave that led to the highest ever July temperature (36.7°C in *Greater London*), which was also the highest monthly value in the UK since August 2003. The good weather didn't last long though, as a series of Atlantic depressions led to a colder, wetter and duller than normal month, especially in *Scotland* and *Northern Ireland*. The final three butterfly species to emerge over the month were **Silver-spotted Skipper** (9th in *Surrey*), **Brown Hairstreak** (16th in *Oxfordshire*) and **Scotch Argus** (22nd *Polymailly, Highland*).

There was no improvement in the weather during **AUGUST**, which was another colder, wetter and duller than average month. The weather was particularly poor across *southern Britain* and in *Northern Ireland*, with for example it being the wettest August across *south-east England* since 1977. *Eastern England* fared best with mercury levels peaking at 30°C on 22nd August in *London*.

## Autumn

After a disappointing July and August, hopes of a repeat performance of 2014's Indian summer failed to materialise in **SEPTEMBER**. For the fifth month in a row, the mean temperature was below average (by almost 1°C). The weather was unsettled for much of the month, though there were one or two fine spells, including during the last formal week of the transect walking season at the end of the month. On the positive side, sunshine levels were above average, whilst rainfall was below average. Quite remarkably on the 30th, the months' maximum (24.0°C) and minimum temperatures (-1.3°C) were recorded at the same locality – *Braemar in Aberdeenshire*, with a temperature range over the day of 25.3°C!

Given the weather conditions (the coldest and wettest summer for three years), not surprisingly it was a poor year for summer-flying species across the UK, with the vast majority declining in annual abundance and/or having below-average years. One

of the worst affected species was the **Small Copper**, which dropped in annual abundance by 24% to suffer its worst year on record, with the butterfly now in a state of significant long-term decline. Sharp annual decreases in abundance included at *North Warren, Suffolk* (170 in 2014 to 53 in 2015) and at *Swift Valley Country Park, Warwickshire* (67 in 2014 to 3 in 2015).

**Wall, Small Tortoiseshell, Green-veined White, Grayling, Speckled Wood, Brown Argus** and **Purple Emperor** numbers were down by a quarter or more over 2014 levels, with all of these species having below average years. Of these, **Grayling** and **Wall** both had their second worst years in the series, with annual decreases of 44% and 38% respectively. **Wall** has declined by almost 90% since 1976 on monitored sites, though on the positive side it is expanding northwards at its range margin in north-east Britain, and has moved uphill in some upland areas.

**Small Tortoiseshell** fared no better, with abundance down by 44% from 2014 levels and with a shocking 73% long-term decline. The butterfly was especially badly affected in *Cambridgeshire, Norfolk, Dorset* and *Suffolk*, but numbers 'held up' in some areas including *Surrey, Warwickshire* and across *Northern Ireland*. Substantial 2014 to 2015 decreases included at *Warners Farm House Field, Cambridgeshire* (from 402 to 74), *Alners Gorse, Dorset* (172 to 23), *Ludham Marsh, Norfolk* (331 to 36) and *Cavenham Heath, Suffolk* (268 to 56).

For the 20th year in a row **White-letter Hairstreak** had a below average year, with an annual decrease of 12% logged. This butterfly was seen at only a fifth of sites with past records, and has declined in abundance more severely than any other UK butterfly since 1976, by an alarming 97%.

It was a poor year for the 'golden' skippers. **Small, Essex** and **Lulworth Skipper** had well below average years, whilst **Large Skipper** declined in abundance by 19% from 2014. **Small, Lulworth** and **Essex Skipper** show some of the most extreme long-term declines amongst UK butterflies; of 73%, 72% and 87% respectively.



Purple Emperor. Photograph by Tom Brereton



It was not all bad news, with three grassland browns, **Meadow Brown**, **Scotch Argus** and **Gatekeeper** all increasing from 2014 by between 13-18%. **Meadow Brown** fared best, with the year ranking 13th in the series. Noteworthy annual increases for **Meadow Brown** included at *Giant Hill (Cerne Abbas), Dorset* (1,598 in 2014 to 3,009 in 2015), *Derbyshire Dales NNR, Peak District* (200 to 605) and at *West Sedgemoor (South), West Country* (1,476 to 3,187). **Comma** also had a reasonable year, with abundance up by 12% and the year ranking 15th in the series. **Holly Blue** has been in the doldrums for much of the last decade, so an annual increase of 43% was highly welcome. There were some impressive increases in abundance from 2014 including at *Benfleet Downs, Cambridgeshire* (126 in 2014 to 382 in 2015), *Southampton Old Cemetery, Hampshire* (from 14 to 91) and *Tower Hamlets Cemetery Park, London* (95 to 189). The butterfly remains thin on the ground in some areas though. In *Warwickshire*, for example, the combined index total was a mere 27 from 25 sites.

Of the summer flying whites, **Small White** and **Large White** showed modest annual increases, though **Green-veined White** was down by 40% from 2014 levels. Each of these species show negative long-term trends of between 10 and 30%, though the apparent declines are not statistically significant.

It was a decidedly average year for the three regular migrants. There were some signs in the spring that a big immigration of **Painted Lady** was on the cards, but this failed to materialise, though abundance was up by 186% from the poor year of 2014. Annual decreases of 40% and 63% were recorded for **Red Admiral** and **Clouded Yellow** respectively. For **Red Admiral**, three figure indices were logged at just two sites, the maximum being 125 at *Minsmere, Suffolk*. The highest **Clouded Yellow** index was 29 at *Whippingham (fields), on the Isle of Wight*.



Gatekeeper was seen into October in Warwickshire. Photograph by Tony Cox

With it being too late in the season to make a great deal of difference, **OCTOBER** finally saw good spells of settled weather. Temperature was above average, being particularly favourable in Scotland whilst rainfall was well below average and sunshine around the seasonal norm. Over the month, 177 visits were made to 116 transect sites, with 22 species recorded (same number as in 2014) from the 1st to 27th. Oddities included several Gatekeepers at *Ryton Pools Country Park, Warwickshire* on the 2nd, a **Swallowtail** in the *Bovey Valley, Dartmoor, Devon* on the 16th and both **Adonis Blue** and **Chalk Hill Blue** on the 20th at *Deep Dean, East Sussex*.

### Second winter period

Although no transects were walked in **NOVEMBER** and **DECEMBER**, butterflies continued to be reported to Butterfly Conservation with at least 8 species recorded, including **Brimstones** on the 27th and 29th December, respectively in north *Nottinghamshire* and *Suffolk*.

## Long-term trends

UK-wide and country level trends are described below, whilst further information on each species, including individual collated index plots, are available at the UKBMS website [www.ukbms.org](http://www.ukbms.org).

### UNITED KINGDOM

For the UK we are able to report on long-term and ten-year trends for 57 of the 59 regularly occurring species, including 29 habitat specialist species, 25 wider countryside species and the three regular migrants (Table 1). Since 1976, 40% of species show positive trends, 58% show negative trends, whilst **Meadow Brown** shows no change. Of the species with a significant trend, 13 species (37% of the total) show a long-term increase, whilst 22 (63%) are in significant decline. The top ten species showing the most acute long-term decline (in rank order, most rapidly declining first) are **White-letter**

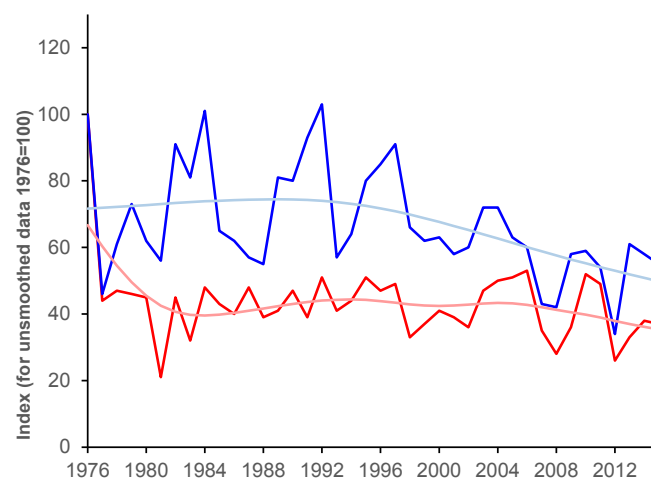


Figure 3. Trends in butterfly populations for habitat specialists (red) and species of the wider countryside (blue) 1976 to 2015. For each species group, darker lines are unsmoothed indices, paler lines are smoothed trends.

**Hairstreak, Wood White, Heath Fritillary, Wall Brown, Essex Skipper, Chequered Skipper, Small Skipper, Small Tortoiseshell, Lulworth Skipper and Pearl-bordered Fritillary.** The top ten species showing the greatest population increase (in rank order, largest first) are **Large Blue, Silver-spotted Skipper, Ringlet, Large Heath, Red Admiral, Dark Green Fritillary, Adonis Blue, Scotch Argus, Comma** and **Silver-washed Fritillary.**

Over the last decade the overall picture is quite different, with 49% of species showing negative trends including all three regular migrants, whilst 53% show positive trends. This is a more positive picture than the previous years' assessment, with the number of species showing positive trends up by six percentage points. **Duke of Burgundy, Dingy Skipper, Small Skipper** and **Small Tortoiseshell** have all increased significantly over the last decade, whilst the **Heath Fritillary** has significantly decreased.

The combined measure of butterfly abundance includes index data from 29 habitat specialist and 25 wider countryside species. Since 1976, habitat specialists and wider countryside species show apparent declines of 47% and 30% respectively. Analysis of the underlying smoothed trends shows that since 1976 both habitat specialists and species of the wider countryside have undergone significant moderate declines. The combined index for 54 resident species (i.e. excluding the regular migrants) shows an apparent decrease of 25% since 1976, with the underlying analysis suggesting the change is statistically significant. The three regular migrants show an apparent increase of 366% since 1976, though with high annual variability the underlying smoothed trend is classed as uncertain.

Over the last decade, combined measures for all residents, for habitat specialists, for wider countryside species and for migrants all show apparent negative trends. Over the last five years (since 2010), habitat specialist butterflies have shown an apparent decrease from 52% to 37% of the 1976 level,



Dingy Skipper has increased significantly over the last decade across the UK.  
Photograph by Iain H Leach



Comma. Photograph by Matt Berry

whilst species of the wider countryside show an apparent decrease from 59% to 55% of the 1976 level. However, the underlying analysis shows that neither of these recent changes is statistically significant, with the trend classed as uncertain. In 2015, habitat specialist butterflies decreased by one percentage point from the previous year, whilst wider countryside species decreased by three percentage points.

## ENGLAND

For England, we are able to report on long-term and ten-year trends for 55 of the 57 regularly occurring species, including 27 habitat specialist species, 25 wider countryside species and three regular migrants (Table 2). Since 1976, 33% of species show positive trends, whilst 67% have a negative trend. Of the species showing significant trends, 11 species (32%) show a long-term increase, whilst 23 (68%) are in decline. The ten species in most severe long-term decline (in rank order, largest first) are **White-letter Hairstreak, Wall, Wood White/Heath Fritillary, Essex Skipper, Marsh Fritillary, Scotch Argus, Small Skipper, Small Tortoiseshell** and **Lulworth Skipper.**

Of the 12 species showing a significant population increase, the top ten species (greatest first) are **Large Blue, Silver-spotted Skipper, Clouded Yellow, Dark Green Fritillary, Ringlet, Red Admiral, Silver-washed Fritillary, Adonis Blue, Comma** and **Painted Lady.**

Over the last decade, population changes for England are much improved with 56% of species showing positive trends, whilst 44% show negative trends including the three regular migrants.

Species which have increased significantly include **Duke of Burgundy, Dingy Skipper, Small Skipper** and **Small Tortoiseshell** whilst species in significant decline are **White-letter Hairstreak, Heath Fritillary** and **Marsh Fritillary.** Composite indices of butterfly abundance have been calculated for 25 wider countryside, 27 habitat specialist and three regular migrant species. Since 1976, habitat specialists and wider countryside species show apparent declines of 54% and 46% respectively, whilst the three regular migrants show an apparent increase of 141%. Analysis of the underlying smoothed trends





Duke of Burgundy. Photograph by Peter Eeles

shows that since 1976 both habitat specialists and wider countryside species have declined significantly, by 18% and 36% respectively, whilst the trend for regular migrants is classed as uncertain, due to high annual variability. Since 2007, the smoothed trend for wider countryside species is classed as uncertain, whilst the habitat specialist trend is of an ongoing decline. In 2015, the composite index for habitat specialist butterflies was up by one percentage point from the previous year, whilst the wider countryside species index was down two percentage points.

Since 1990, composite measures for 15 habitat specialist and 23 wider countryside butterflies in woodland habitats in England, show apparent declines of 58% and 60% respectively. Analysis of the underlying smoothed trend shows these declines to be statistically significant. The smoothed trend for habitat specialists shows an ongoing decline, whilst for wider countryside species, the trend since 2004 is classed as uncertain.

Over the same period, composite measures for 21 habitat specialist and 21 wider countryside butterflies in farmland habitats in England show that the 2015 indices were respectively 26% and 81% of the 1990 baseline. The underlying analysis of smoothed trends suggests a progressive moderate decline in both measures. In 2015, there was a sharp drop of 30 percentage points in the habitat specialist index, whilst the wider countryside measure was down six percentage points.

## SCOTLAND

For Scotland we are able to report on long-term and ten-year trends for 24 of the 34 regularly occurring species, including eight habitat specialist species, 15 wider countryside species and two regular migrants, **Red Admiral** and **Painted Lady** (Table 3). Additionally, a nine-year trend is calculable for **Chequered Skipper**. Since 1979, 63% of the 24 species show positive trends, whilst 38% show negative trends. Of the eight species showing significant long-term trends, six showed an increase, with **Wall** and **Grayling** showing a decline. Those species showing significant increases (in rank order, greatest first) are **Orange-tip**, **Small Heath**, **Peacock**, **Ringlet**, **Pearl-bordered Fritillary** and **Scotch Argus**.

Over the last decade, 72% of 25 species show negative trends, including the two regular migrants, whilst 28% of species show positive trends. There are no significantly increasing species, whilst the three species in significant decline are **Painted Lady**, **Chequered Skipper** and **Grayling**.

An underlying analysis of the composite measures for seven habitat specialist species indicates a moderate long-term decline, with the smoothed index in 2015 being 43% lower than in 1979. In contrast, the trend for 15 wider countryside species is classed as stable, with little change in the smoothed index over the 37-year series.

## WALES

In Wales, we are able to report on trends for 33 of the 43 regularly occurring butterfly species in the country including nine habitat specialists, 21 species of the wider countryside and the three regular migrants (Table 4).

Over the long-term, 42% of species show a positive trend, whilst 58% have a negative trend. Of the 17 species showing significant long-term change, 11 species are in decline (65%), whilst six (35%) are increasing. The declining species are (most severely declining first) **Clouded Yellow**, **Silver-washed Fritillary**, **Grayling**, **Marsh Fritillary**, **Small White**, **Large Skipper**, **Dark Green Fritillary**, **Large White**, **Small Copper**, **Peacock** and **Small Pearl-bordered Fritillary**. The increasing species (most rapid first) are **Orange-tip**, **Pearl-bordered Fritillary**, **Ringlet**, **Green Hairstreak**, **Comma**, and **Speckled Wood**.

Over the last decade 64% of species show positive trends, including **Small Skipper**, **Pearl-bordered Fritillary**, **Small Heath** and **Ringlet** which have increased significantly, whilst 36% of species show negative trends, including the **Large White** which declined significantly.

## NORTHERN IRELAND

In Northern Ireland, ten-year trends are now calculable for 13 species (Table 5). Over the decadal period, four species have increased, whilst nine species have decreased. Species which show significant changes are **Ringlet**, which has increased by over 170% and **Small Heath** which has dropped in numbers by almost three-quarters.

### Notes on Summary Tables 1-4

*In the following summary tables the number of sites monitored is a count of all sites on which a species has been monitored in the current analysis year, including those sites on which a species was absent but has been formerly recorded, and thus contribute to the calculation of the national index. For habitat specialist and regular migrant species only sites with sufficient data to calculate a site-level index for each species are included. As with wider countryside species this includes sites where a species was absent in the most recent year but was formerly recorded, if the site has been sufficiently well recorded during the flight period of that species. For species where at country level there are insufficient data to calculate accurate trends the number of sites refers to the total number of sites at which the species was recorded in the current analysis year.*

*Note: some country-level changes are based on relatively small sample sizes and thus should be interpreted with caution.*

**Table 1. Summary of species abundance changes in the UK from 2014 to 2015 and long-term (over the entire time series: no. yrs max = 39) and short-term (last 10-years) changes. The mean flight date is calculated as the weighted mean date of counts and is highly correlated to both first appearance and the peak flight date (Botham et al. 2008). Significance of trends: \*P < 0.05 (significant), \*\*P < 0.01 (highly significant), \*\*\*P < 0.001 (very highly significant). Red text has been used to highlight those species that had their worst year of the series in 2015 and blue text best year in the series.**

Species	Start Year	No. years with Index in 2015	No. sites monitored in 2015	2015 Rank	% change 2014-2015	Series trend (%)	10-year trend (%)	Mean flight date 2015	Series Mean Flight date
Swallowtail	1976	36	5	30	-65	66	23	02-Jul	21-Jun
Dingy Skipper	1976	40	325	10	0	-14	90*	01-Jun	28-May
Grizzled Skipper	1976	40	221	35	0	-39*	-5	28-May	23-May
Chequered Skipper	2003	9	19	8	14	-82***	-72*	04-Jun	29-May
Essex Skipper	1977	39	1102	29	7	-87***	16	24-Jul	19-Jul
Small Skipper	1976	40	2320	29	-8	-73***	121*	20-Jul	16-Jul
Lulworth Skipper	1992	24	14	14	-15	-72**	200	27-Jul	23-Jul
Silver-spotted Skipper	1979	37	36	9	-9	931***	53	14-Aug	14-Aug
Large Skipper	1976	40	2350	17	-19	-16	41	05-Jul	03-Jul
Wood White	1979	37	48	30	-10	-89***	41	18-Jun	15-Jun
Cryptic Wood White	n/a	n/a	6	n/a	n/a	n/a	n/a	04-Jun	03-Jun
Orange-tip	1976	40	2170	14	-21	10	66	16-May	09-May
Large White	1976	40	3530	25	59	-30	-20	21-Jul	18-Jul
Small White	1976	40	3533	33	4	-27	-1	22-Jul	17-Jul
Green-veined White	1976	40	3411	32	-40	-10	38	08-Jul	03-Jul
Clouded Yellow	1979	37	407	16	-68	728	-32	08-Aug	07-Aug
Brimstone	1976	40	2122	1	7	8	37	08-Jun	31-May
Wall	1976	40	1085	39	-44	-88***	-17	27-Jul	19-Jul
Speckled Wood	1976	40	3150	24	-29	76***	-5	26-Jul	22-Jul
Large Heath	1990	26	8	14	-19	249***	-56	07-Jul	06-Jul
Small Heath	1976	40	2133	33	-10	-56***	27	09-Jul	09-Jul
Mountain Ringlet	n/a	n/a	2	n/a	n/a	n/a	n/a	11-Jul	14-Jul
Scotch Argus	1979	37	109	28	15	153**	23	08-Aug	09-Aug
Ringlet	1976	40	3030	3	-19	378***	64	15-Jul	11-Jul
Meadow Brown	1976	40	3649	13	13	0	13	21-Jul	20-Jul
Gatekeeper	1976	40	2969	24	18	-39*	-6	01-Aug	30-Jul
Marbled White	1976	40	1419	1	0	57*	62	15-Jul	11-Jul
Grayling	1976	40	169	39	-38	-61***	-7	05-Aug	02-Aug
Pearl-bordered Fritillary	1976	40	116	24	4	-70***	87	01-Jun	27-May
Small Pearl-bordered Fritillary	1976	40	116	37	-17	-61***	5	24-Jun	21-Jun
Silver-washed Fritillary	1976	40	442	4	-5	153***	8	26-Jul	23-Jul
Dark Green Fritillary	1976	40	369	7	3	196***	6	21-Jul	18-Jul
High Brown Fritillary	1978	38	72	23	-43	-64*	46	15-Jul	12-Jul
White Admiral	1976	40	212	31	-19	-60***	-43	16-Jul	12-Jul
Purple Emperor	1979	37	70	26	-25	59	-32	20-Jul	15-Jul
Red Admiral	1976	40	834	23	-40	234**	-45	05-Aug	29-Jul
Painted Lady	1976	40	678	16	186	136	-88	30-Jul	21-Jul
Peacock	1976	40	3403	13	-21	19	33	30-Jun	16-Jun
Small Tortoiseshell	1976	40	3382	28	-44	-73***	216*	09-Jul	28-Jun
Comma	1976	40	2737	15	12	149***	-26	20-Jul	14-Jul
Marsh Fritillary	1981	35	107	26	-18	-16	-62	05-Jun	01-Jun
Glanville Fritillary	1989	24	10	11	67	-33	-75	08-Jun	10-Jun
Heath Fritillary	1981	35	40	35	-16	-89***	-84***	02-Jul	28-Jun
Duke of Burgundy	1979	36	96	18	-7	-40*	80*	29-May	26-May
Small Copper	1976	40	2418	40	-24	-43*	-46	01-Aug	27-Jul
Brown Hairstreak	1983	33	63	16	5	-13	-5	28-Aug	26-Aug
Purple Hairstreak	1976	40	664	32	8	-55*	-17	30-Jul	25-Jul
Green Hairstreak	1976	40	358	21	-9	-37*	-2	28-May	24-May
White-letter Hairstreak	1976	40	273	39	-12	-97***	-74*	25-Jul	19-Jul
Black Hairstreak	1995	20	9	4	141	-34	-78	28-Jun	20-Jun
Small Blue	1978	38	174	24	29	3	-19	01-Jul	27-Jun
Holly Blue	1976	40	2091	12	227	43	-31	30-Jun	20-Jun
Large Blue	1983	33	32	3	129	1306***	25	19-Jun	24-Jun
Silver-studded Blue	1979	37	73	23	12	12	-6	15-Jul	11-Jul
Brown Argus	1976	40	1158	23	-28	-24	8	31-Jul	27-Jul
Northern Brown Argus	1979	37	36	31	-4	-53*	19	11-Jul	07-Jul
Common Blue	1976	40	2816	21	-7	-18	30	24-Jul	19-Jul
Adonis Blue	1979	37	92	23	-2	158*	-46	25-Jul	20-Jul
Chalk Hill Blue	1976	40	181	23	-5	18	66	08-Aug	07-Aug



**Table 2. England summary of species abundance changes from 2014 to 2015 and long-term (over the entire time series: no. yrs max = 39) and short-term (last 10-years) changes. Significance of trends: \*P < 0.05 (significant), \*\*P < 0.01 (highly significant), \*\*\*P < 0.001 (very highly significant). Red text has been used to highlight those species that had their worst year of the series in 2015 and blue text best year in the series.**

Species	Start Year	No. years with Index in 2014	No. sites monitored in 2014	2014 Rank	% change 2013-2014	Series trend (%)	10-year trend (%)
Swallowtail	1976	36	5	30	-65	66	23
Dingy Skipper	1976	40	317	13	-7	-8	90*
Grizzled Skipper	1976	40	218	35	0	-40**	-5
Essex Skipper	1977	39	787	28	7	-87***	14
Small Skipper	1976	40	1494	29	-6	-74***	112*
Lulworth Skipper	1992	24	14	14	-15	-72**	200
Silver-spotted Skipper	1979	37	36	9	-9	931***	53
Large Skipper	1976	40	1516	17	-19	-13	41
Wood White	1979	37	48	30	-10	-89***	41
Orange-tip	1976	40	1250	16	-21	-1	73
Large White	1976	40	1809	23	63	-29	-17
Small White	1976	40	1804	30	6	-24	1
Green-veined White	1976	40	1727	30	-35	-13	39
Clouded Yellow	1979	37	385	16	-67	758*	-33
Brimstone	1976	40	1361	1	7	7	38
Wall	1976	40	580	40	-51	-90***	-21
Speckled Wood	1976	40	1717	23	-28	79**	-4
Large Heath	n/a	n/a	3	n/a	n/a	n/a	n/a
Small Heath	1976	40	1151	33	-13	-61***	36
Mountain Ringlet	n/a	n/a	1	n/a	n/a	n/a	n/a
Scotch Argus	1995	21	13	19	86	-75***	-17
Ringlet	1976	40	1660	3	-19	401***	64
Meadow Brown	1976	40	1824	13	13	-2	12
Gatekeeper	1976	40	1684	24	19	-44**	-5
Marbled White	1976	40	963	1	0	56*	62
Grayling	1976	40	144	39	-30	-42**	1
Pearl-bordered Fritillary	1978	38	82	26	102	-58**	28
Small Pearl-bordered Fritillary	1978	38	98	33	-18	-43**	37
Silver-washed Fritillary	1976	40	431	5	-5	173***	5
Dark Green Fritillary	1976	40	334	8	3	414***	10
High Brown Fritillary	1978	38	63	24	-44	-65*	49
White Admiral	1976	40	211	31	-19	-60***	--43
Purple Emperor	1979	37	70	26	-25	59	-32
Red Admiral	1976	40	769	23	-40	240***	-45
Painted Lady	1976	40	633	17	172	144	-88
Peacock	1976	40	1764	12	-21	20	39
Small Tortoiseshell	1976	40	1758	27	-45	-73***	261*
Comma	1976	40	1621	15	12	148***	-26
Marsh Fritillary	1982	34	69	28	135	-77**	-87*
Glanville Fritillary	1989	24	8	11	67	-33	-75
Heath Fritillary	1981	35	40	35	-16	-89***	-84***
Duke of Burgundy	1979	36	96	18	-7	-40*	80*
Small Copper	1976	40	1353	40	-31	-40*	-47
Brown Hairstreak	1983	33	62	16	5	-14	-7
Purple Hairstreak	1976	40	446	32	14	-58*	-12
Green Hairstreak	1976	40	338	34	-21	-44**	-23
White-letter Hairstreak	1976	40	198	39	-6	-96***	-74*
Black Hairstreak	1995	20	9	4	141	-34	-78
Small Blue	1979	37	166	21	35	-37	-17
Holly Blue	1976	40	1301	12	235	44	-28
Large Blue	1983	33	32	3	129	1306***	25
Silver-studded Blue	1984	32	69	20	9	-29	7
Brown Argus	1976	40	791	22	-28	-23	7
Northern Brown Argus	1979	34	32	30	-9	-68***	16
Common Blue	1976	40	1574	20	-5	-16	32
Adonis Blue	1979	37	92	23	-2	158*	-46
Chalk Hill Blue	1976	40	181	23	-5	18	66





**Table 3. Scotland summary of species abundance changes from 2014 to 2015 and long-term (over the entire time series: no. yrs max = 39) and short-term (last 10-years) changes. Significance of trends: \*\*\*P < 0.001 (very highly significant). Red text has been used to highlight those species that had their worst year of the series in 2015 and blue text best year in the series.**

Species	Start Year	No. years with Index in 2015	No. sites monitored in 2015	2015 Rank	% change 2014-2015	Series trend (%)	10-year trend (%)
Chequered Skipper	2003	9	19	8	14	-82***	-72*
Dingy Skipper	n/a	n/a	1	n/a	n/a	n/a	n/a
Small Skipper	n/a	n/a	3	n/a	n/a	n/a	n/a
Large Skipper	n/a	n/a	5	n/a	n/a	n/a	n/a
Orange-tip	1999	17	108	4	-28	248***	55
Large White	1979	37	108	37	-71	-10	-72
Small White	1979	37	108	34	-64	-19	-42
Green-veined White	1979	37	158	34	-67	21	45
Clouded Yellow	n/a	n/a	1	n/a	n/a	n/a	n/a
Wall	1999	17	10	14	-52	-85*	-34
Speckled Wood	2001	15	40	13	-46	2	-5
Large Heath	n/a	n/a	11	n/a	n/a	n/a	n/a
Small Heath	1979	37	112	10	-2	211***	-20
Mountain Ringlet	n/a	n/a	1	n/a	n/a	n/a	n/a
Scotch Argus	1990	26	33	8	0	44*	62
Ringlet	1999	17	129	3	-24	94**	44
Meadow Brown	1979	37	140	20	-14	5	-35
Grayling	1990	17	4	17	-20	-76***	-69*
Pearl-bordered Fritillary	2002	10	21	2	5	67*	27
Small Pearl-bordered Fritillary	1979	33	11	16	9	23	-49
Dark Green Fritillary	1979	35	14	33	-24	-34	-49
Red Admiral	1980	29	20	19	-51	87	-72
Painted Lady	1980	21	10	16	145	-71	-96*
Peacock	1995	21	133	12	-45	177*	-33
Small Tortoiseshell	1979	37	137	24	-35	-44	43
Comma	2006	10	34	7	-17	-43	-43
Marsh Fritillary	n/a	n/a	10	n/a	n/a	n/a	n/a
Small Copper	1979	37	87	29	38	-35	-45
Green Hairstreak	1990	15	6	12	-76	67	-24
Small Blue	2005	11	4	11	-74	13	-8
Holly Blue	n/a	n/a	2	n/a	n/a	n/a	n/a
Northern Brown Argus	1981	20	4	9	91	47	-41
Common Blue	1979	37	97	16	7	110	28



**Table 4. Wales summary of species abundance changes from 2014 to 2015 and long-term (over the entire time series: no. yrs max = 39) and short-term (last 10-years) changes. Significance of trends:** \*P < 0.05 (significant), \*\*P < 0.01 (highly significant), \*\*\*P < 0.001 (very highly significant). Red text has been used to highlight those species that had their worst year of the series in 2015 and blue text best year in the series.

Species	Start Year	No. years with Index in 2015	No. sites monitored in 2015	2015 Rank	% change 2014-2015	Series trend (%)	10-year trend (%)
Dingy Skipper	2004	6	8	4	58	-51	-42
Grizzled Skipper	n/a	n/a	4	n/a	n/a	n/a	n/a
Essex Skipper	n/a	n/a	2	n/a	n/a	n/a	n/a
Small Skipper	1984	32	61	6	2	26	345***
Large Skipper	1977	39	50	18	-17	-73***	49
Orange-tip	1978	38	48	3	-27	339***	22
Large White	1976	40	82	39	-24	-60**	-63*
Small White	1976	40	84	40	-57	-74***	2
Green-veined White	1976	40	82	25	-54	79	58
Clouded Yellow	1983	16	10	16	>-95	>-95*	>-95
Brimstone	1998	18	29	6	-5	-2	33
Wall	1976	40	50	34	-42	-39	37
Speckled Wood	1978	38	79	18	-34	109**	-17
Large Heath	n/a	n/a	2	n/a	n/a	n/a	n/a
Small Heath	1976	40	58	15	-15	25	60*
Ringlet	1983	33	77	2	-2	242***	162**
Meadow Brown	1976	40	89	15	-4	27	25
Gatekeeper	1978	38	74	16	16	37	-16
Marbled White	n/a	n/a	5	n/a	n/a	n/a	n/a
Grayling	1976	29	14	20	-33	-83***	37
Pearl-bordered Fritillary	1997	18	13	8	-56	244**	216*
Small Pearl-bordered Fritillary	1993	16	8	14	-22	-40*	19
Silver-washed Fritillary	1995	15	10	13	-45	-90**	54
Dark Green Fritillary	1979	21	16	11	4	-68***	99
High Brown Fritillary	1995	12	9	2	35	16	118
Red Admiral	1976	40	22	22	-53	129	-53
Painted Lady	1977	27	18	11	379	-43	-77
Peacock	1976	40	80	16	-2	-52*	40
Small Tortoiseshell	1976	40	87	23	-17	-35	94
Comma	1992	24	60	4	44	135*	-17
Marsh Fritillary	1990	26	22	12	-23	-77*	205
Small Copper	1976	40	63	33	-16	-55*	-12
Brown Hairstreak	n/a	n/a	1	n/a	n/a	n/a	n/a
Purple Hairstreak	2002	14	11	12	-68	-62	-70
Green Hairstreak	1993	21	8	5	-49	241*	84
White-letter Hairstreak	n/a	n/a	2	n/a	n/a	n/a	n/a
Small Blue	n/a	n/a	3	n/a	n/a	n/a	n/a
Silver-studded Blue	n/a	n/a	6	n/a	n/a	n/a	n/a
Holly Blue	1999	17	47	7	18	-36	-59
Brown Argus	1977	19	10	14	-59	36	-24
Common Blue	1976	40	70	34	-43	-14	3



**Table 5. Northern Ireland summary of species abundance changes from 2014 to 2015 and long-term (over the entire time series: no. yrs max = 39) and short-term (last 10-years) changes. Significance of trends: \*P < 0.05 (significant), \*\*P < 0.01 (highly significant), \*\*\*P < 0.001 (very highly significant). Red text has been used to highlight those species that had their worst year of the series in 2015 and blue text best year in the series.**

Species	Start Year	No. years with Index in 2015	No. sites monitored in 2015	2015 Rank	% change 2014-2015	Series trend (%)	10-year trend (%)
Dingy Skipper	n/a	n/a	1	n/a	n/a	n/a	n/a
Cryptic Wood White	n/a	n/a	6	n/a	n/a	n/a	-n/a
Orange-tip	2007	9	23	7	-44	-41	-41
Large White	2006	10	40	10	-69	-35	-35
Small White	2006	10	39	10	-72	-63	-63
Green-veined White	2005	11	47	10	-64	96	47
Speckled Wood	2007	9	43	9	-68	13	13
Small Heath	2006	10	21	8	0	-73*	-73*
Ringlet	2006	10	48	4	-40	179*	179*
Meadow Brown	2009	7	48	5	-11	-37	-37
Grayling	n/a	n/a	3	n/a	n/a	n/a	n/a
Silver-washed Fritillary	n/a	n/a	3	n/a	n/a	n/a	n/a
Dark Green Fritillary	n/a	n/a	7	n/a	n/a	n/a	n/a
Red Admiral	n/a	n/a	8	n/a	n/a	n/a	n/a
Painted Lady	n/a	n/a	6	n/a	n/a	n/a	n/a
Peacock	2006	10	34	9	-69	-77	-77
Small Tortoiseshell	2010	6	46	3	12	-65	-65
Marsh Fritillary	2004	12	10	10	-69	-4	-54
Small Copper	2005	11	22	11	-70	-46	-45
Green Hairstreak	n/a	n/a	2	n/a	n/a	n/a	n/a
Holly Blue	n/a	n/a	2	n/a	66	n/a	n/a
Common Blue	2005	11	17	2	10	-11	48



Brimstone was seen as late as 29th December in 2015.  
Photograph by Tom Brereton



Silver-studded Blue. Photograph by Jim Asher



**The Centre for Ecology & Hydrology (CEH)** is the UK's Centre of Excellence for integrated research in terrestrial and freshwater ecosystems and their interaction with the atmosphere. As part of the Natural Environment Research Council (NERC) CEH works in partnership with the research community, policymakers, industry and society, to deliver world-class solutions to the most complex environmental challenges facing humankind.



**Butterfly Conservation (BC)** is the charity aimed at securing a lasting future for butterflies, moths and their habitats. It works in partnership with thousands of volunteers and a wide range of organisations in the UK and Europe to secure a healthy environment where we all can live.



**The British Trust for Ornithology (BTO)** is an independent charitable research institute combining professional and citizen science aimed at using evidence of change in wildlife populations, particularly birds, to inform the public, opinion-formers and environmental policy- and decision-makers.



**The Joint Nature Conservation Committee (JNCC)** is the statutory adviser to Government on UK and international nature conservation. Its work contributes to maintaining and enriching biological diversity, conserving geological features and sustaining natural systems. JNCC delivers the UK and international responsibilities of the four country nature conservation agencies - Council for Nature Conservation and the Countryside, Natural Resources Wales, Natural England and Scottish Natural Heritage.



**Natural Resources Wales (NRW)** is the principle adviser to the Welsh Government on the environment, enabling the sustainable development of Wales' natural resources for the benefit of people, the economy and wildlife.



**The Forestry Commission (FC)** is the government department for forestry in Great Britain. It works to improve people's lives through the many benefits provided by sustainably managed woods and forests, including timber production, public recreation, nature conservation, and rural and community development. It does this by supporting woodland managers with grants, tree felling licences, regulation and advice, and advising Ministers in the UK, Scottish and Welsh Assembly Governments on forestry policy. It manages more than 1 million hectares (2.5 million acres) of public forest land owned or leased by Ministers to provide the above benefits, and through its Forest Research agency, it conducts world-class scientific research and technical development relevant to forestry.



**Natural England** is an independent public body whose purpose is to protect and improve England's natural environment, for its intrinsic value, the wellbeing and enjoyment of people and the economic prosperity that it brings.



**Scottish Natural Heritage (SNH)** is the government body that looks after all of Scotland's nature and landscapes, across all of Scotland, for everyone.



**Northern Ireland Environment Agency (NIEA)** is the agency for the protection and conservation of the natural and built environment in Northern Ireland

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